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EXAMINER

THOMAS, ERIC W

ART UNIT	PAPER NUMBER
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2831

DATE MAILED: 12/19/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/842,975

Applicant(s)

HARRIS ET AL.

Examiner

Eric W Thomas

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 23 September 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-46 is/are pending in the application.
- 4a) Of the above claim(s) 25-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10, 14-24 and 31-46 is/are rejected.
- 7) ☒ Claim(s) 11-13 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

**DETAILED ACTION**

***Election/Restrictions***

1. Applicant's election without traverse of invention I in Paper No. 4 is acknowledged.

***Information Disclosure Statement***

2. The Prior Art listed on page 4 of the IDS filed 2/4/02 was not considered. The applicant did not provide a legible copy of said prior art. Page 4 of the IDS has been placed in the application file, but the information referred to therein has not been considered.

***Claim Objections***

3. Claims 6, and 10 are objected to because of the following informalities:  
  
Claim 6, line 1 insert —at least one—before “electrical”.  
  
Claim 10 line 2 delete “MEMS”.  
  
Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:  
  
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
5. Claims 31-37, 41-46 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Claim 31 recites the limitation "the at least one conductive element" in lines 6-7.

There is insufficient antecedent basis for this limitation in the claim.

7. Claim 32 recites the limitation "the at least one stationary element" in line 6.

There is insufficient antecedent basis for this limitation in the claim.

8. Claim 41 recites the limitation "the conductive elements" in line 6. There is insufficient antecedent basis for this limitation in the claim. \*\*The examiner treated this limitation as "the stationary elements".

9. Claim 42 recites the limitation "the at least two conductive element" in line 3.

There is insufficient antecedent basis for this limitation in the claim. \*\*The examiner treated this limitation as "the stationary elements".

### ***Claim Rejections - 35 USC § 102***

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

11. Claims 1, 4, 5 are rejected under 35 U.S.C. 102(e) as being anticipated by

Bishop et al (US 6,400,009):

Bishop et al. disclose in fig. 1-2, a MEMS structure comprising a substrate (40), at least one conductive element that is in mechanical communication with the substrate and that extends there from (not expressly stated in the reference but is shown in fig. 2); a movable MEMS element (25) having a portion that is free from the substrate and position such that a gap separates the movable MEMS element from the at least one conductive element; at least one electrical trace (100) having a first terminal end in electrical communication with the at least one conductive element and a second terminal end in electrical communication with a peripheral region; and a cap (70, 30, 80) attached to the substrate inside the peripheral region having upper and sidewalls that encapsulate the at least one conductive element and the movable MEMS element.

Regarding claim 4, Bishop et al. disclose the cap is conductive.

Regarding claim 5, Bishop et al. disclose the cap is formed from silicon.

12. Claims 31-32, 35, 38-40, as best understood, are rejected under 35 U.S.C. 102(e) as being anticipated by Lin et al. (US 6,232,150).

Lin et al. disclose in fig. 1a-1e, a MEMS structure disposed within a peripheral region comprising a substrate (Si substrate & Thermal Oxide layer); a movable MEMS element (resonator anchor-comb-shape resonator) having distal end in mechanical communication with the substrate, and a middle portion disposed its two distal ends free from the substrate; and a cap (Silicon Nitride) attached to the substrate having upper and side walls that encapsulate at least one conductive element (polysilicon) and the movable MEMS element.

Regarding claim 32, Lin et al. disclose in fig. 1a-1e, the cap separates the MEMS structure from the peripheral region, the MEMS structure further comprising: a stationary MEMS element in mechanical communication with the substrate and disposed adjacent the movable MEMS element; and at least one electrical trace having a first terminal end in electrical communication (polysilicon – see fig. 1a) with the at least one stationary element and a second terminal end in electrical communication with the peripheral region (not shown – It should be noted that Lin et al. disclose in col. 2 lines 1-65 that electrical connection is made via pads outside the cap).

Regarding claim 35, Lin et al. disclose the stationary MEMS element is conductive.

Regarding claim 38, Lin et al. disclose in fig. 1a-1e, a MEMS structure surrounded by a peripheral region, the MEMS structure comprising: a substrate (Si substrate & Thermal Oxide layer); at least one stationary element (polysilicon) that is in mechanical communication with the substrate; a movable MEMS element disposed adjacent the conductive element, and having a distal end in mechanical communication with the substrate, and a middle portion disposed between its two distal ends free from the substrate; and at least one electrical trace having a first terminal end in electrical communication with the at least one stationary element and a second terminal end in electrical communication with the peripheral region.

Regarding claim 39, Lin et al. disclose in fig. 1a-1e, the MEMS structure further comprising a cap attached to the substrate inside the peripheral region having upper

walls and side walls that encapsulate the at least one conductive element and the movable MEMS element.

Regarding claim 40, Lin et al. disclose in fig. 1a-1e, the second terminal extends outside the cap.

13. Claims 41, 45-46 are rejected under 35 U.S.C. 102(e) as being anticipated by Goodwin-Johansson (US 6,373,682).

Regarding claim 41, Goodwin-Johansson discloses (as seen in fig. 3, 9) a MEMS structure surrounded by a peripheral region, the MEMS structure comprising: a substrate (10); a first (30) and second stationary elements (40) in mechanical communication with the substrate; a movable MEMS element disposed adjacent the stationary elements, and having a distal end in mechanical communication with the substrate, and a middle portion disposed between its two distal ends free from the substrate; and a first and second electrical trace having first terminal ends in electrical communication with the first and second stationary elements, respectively, and having second terminal ends in electrical communication with the peripheral region.

Regarding claim 45, Goodwin-Johansson discloses the movable MEMS element further comprises at least two conductive elements (66, 68).

Regarding claim 46, Goodwin-Johansson discloses the two conductive elements are electrically isolated from each other.

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14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

16. Claims 1-3, 6-10, 14-24, 31-34, 36-37, & 41-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goodwin-Johansson (US 6,373,682) in view of Lin et al. (US 6,232,150).

Regarding claims 1, 6, & 7, Goodwin-Johansson discloses in fig. 1, 3, & 9, a MEMS structure comprising: a substrate (10, 20); at least one conductive element (30) that is in mechanical communication with the substrate and that extends there from; a movable MEMS element (60) having a portion that is free (90) from the substrate and positioned such that a gap separates the movable MEMS element from the at least one conductive element; (as seen in fig. 9) the conductive element is electrically connected to a peripheral region (the connection inherently having a first terminal end connected to



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the one conductive element and a second terminal end connected to a peripheral region).

Goodwin-Johansson discloses the claimed invention except for the at least one connection is a (copper) trace; and a cap attached to the substrate inside the peripheral region having upper and sidewalls that encapsulate the at least one conductive element and the movable MEMS element.

(Regarding claims 6, 7)The examiner takes Official Notice that it is well known in the art to use copper traces to connect conductive elements to peripheral regions (i.e. another electrical component). It would have been obvious to a person of ordinary skill in the art at the time the invention was made form copper traces to connect the conductive element to a peripheral region, since such a modification would provide a reliable connection to the capacitor.

Lin et al. teach (fig. 1a-1e) the use of a cap to encapsulate a MEMS structure. It would have been obvious to a person of ordinary skill in the art at the time invention was made to modify the MEMS structure of Goodwin-Johansson by using a cap as taught by Lin et al.; since such a modification would prevent contaminants, such as dust, from interfering with the MEMS device.

Regarding claim 2, Lin et al. teach (see fig. 1a-1e) the cap is formed from a silicon nitride.

Regarding claim 3, Lin et al. teach (see fig. 1a-1e) the cap is formed from a high resistivity silicon (silicon nitride).

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Regarding claim 8, the modified Goodwin-Johansson (as modified by Lin et al) disclose a bottom surface of at least one the side walls of the cap is attachable to the substrate.

Regarding claim 9, the modified Goodwin-Johansson (as modified by Lin et al) disclose the sidewalls are connected to the substrate at a location between first and second terminal ends (fig. 9) of the at least one electrical trace.

Regarding claim 10, the modified Goodwin-Johansson (as modified by Lin et al) disclose (fig. 9) the at least one electrical trace is disposed within an interface between the at least one conductive element and the substrate.

Regarding claim 14, Goodwin-Johansson discloses the substrate comprises a nonconductive material (col. 5 lines 55-65).

Regarding claim 15, Goodwin-Johansson discloses a portion of the trace is in electrical communication with the substrate.

Regarding claim 16, Goodwin-Johansson discloses the claimed invention except for the substrate is formed from a conductive material. Silicon is a well-known substrate material used in the MEMS art. It would have been obvious to one having ordinary skill in the art at the time the invention was made to form the substrate from a silicon material, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

Regarding claim 17, Goodwin-Johansson discloses the substrate (see fig. 9) further comprises a recess formed in the upper surface thereof.

Regarding claim 18, Goodwin-Johansson (see fig. 9) discloses the movable MEMS element is disposed above and substantially aligned with the recess.

Regarding claim 19, Goodwin-Johansson discloses the movable MEMS element comprises at least one conductive member (col. 8 lines 5-21) attached to a nonconductive base (50).

Regarding claim 20, the modified Goodwin-Johansson discloses the claimed structure. Regarding the limitation, "the nonconductive base is selectively etchable from the conductive member" is a method of forming the device. The method of forming the device is not germane to the issue of patentability of the device itself. Therefore, this limitation has not been given patentable weight.

Regarding claim 21, the modified Goodwin-Johansson discloses the claimed invention except for the non-conductive base is formed from a silicon dioxide. Silicon dioxide is a well-known material used in MEMS structures. It would have been obvious to one having ordinary skill in the art at the time the invention was made to form the non-conductive base from a silicon dioxide, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

Regarding claim 22, Goodwin-Johansson discloses the substrate is formed from glass (see col. 5 line 63).

Regarding claim 23, Goodwin-Johansson discloses the substrate is formed from silicon.

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Regarding claim 24, Goodwin-Johansson discloses the claimed invention except for the at least one conductive element is selected from the group consisting of silicon, silicon carbide, and gallium arsenide. Silicon is a well-known material used in MEMS structures. It would have been obvious to one having ordinary skill in the art at the time the invention was made to form the at least one conductive element from silicon, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

Regarding claim 31, Goodwin-Johansson discloses (see fig. 3, 9), a MEMS device disposed within a peripheral region comprising; a substrate (10), a moveable MEMS element (60) having distal end in mechanical communication with the substrate, and a middle portion disposed its two distal ends free from the substrate; and a conductive element (40).

Goodwin-Johansson discloses the claimed invention except for a cap attached to the substrate having upper and sidewalls that encapsulate the conductive element and the movable MEMS element.

Lin et al. teach (fig. 1a-1e) the use of a cap to encapsulate a MEMS structure. It would have been obvious to a person of ordinary skill in the art at the time invention was made to modify the MEMS structure of Goodwin-Johansson by using a cap as taught by Lin et al.; since such a modification would prevent contaminants, such as dust, from interfering with the MEMS device.

Regarding claim 32, Goodwin-Johansson (as modified by Lin et al.) the cap separates the MEMS structure from the peripheral (as seen in fig. 9) region, wherein the MEMS structure further comprises; a stationary MEMS element (30) in mechanical communication with the substrate and disposed adjacent the movable MEMS element; and at least one electrical trace (as seen in fig. 9) having a first terminal end in electrical communication with the stationary element and a second terminal end in electrical communication with the peripheral region.

Regarding claim 33, Goodwin-Johansson discloses secondary stationary MEMS element (30) in mechanical communication with the substrate and disposed adjacent to the movable MEMS element; and a second electrical trace (see fig. 9) having a first terminal end in electrical communication with the second stationary MEMS element and a second terminal end in electrical communication with the peripheral region.

Regarding claim 34, Goodwin-Johansson discloses the stationary MEMS elements are electrically isolated from each other.

Regarding claim 36, Goodwin-Johansson discloses the movable MEMES element further comprises at least two conductive elements (66, 68).

Regarding claim 37, Goodwin-Johansson discloses the at least two conductive elements are electrically isolated from each other (see fig. 9).

Regarding claim 42, Goodwin-Johansson discloses the claimed invention except for a cap attached to the substrate having upper and sidewalls that encapsulate the conductive element and the movable MEMS element.

Lin et al. teach (fig. 1a-1e) the use of a cap to encapsulate a MEMS structure. It would have been obvious to a person of ordinary skill in the art at the time invention was made to modify the MEMS structure of Goodwin-Johansson by using a cap as taught by Lin et al.; since such a modification would prevent contaminants, such as dust, from interfering with the MEMS device.

Regarding claim 43, the modified Goodwin-Johansson (as modified by Lin et al.) discloses the second terminal ends extend outside the cap (see fig. 9).

Regarding claim 44, Goodwin-Johansson discloses the second terminal ends are electrically isolated from each other (see fig. 9).

#### ***Allowable Subject Matter***

17. Claims 11-13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

18. The following is a statement of reasons for the indication of allowable subject matter: The prior art does not teach or fairly suggest (taken in combination with the other claimed features) a MEMS structure wherein the interface prevents any portion of the at least one electrical trace from being in electrical communication with the substrate (claims 11); and the interface layer comprises a nonconductive material (claims 12-13).

#### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric W Thomas whose telephone number is (703) 305-

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0878. The examiner can normally be reached on Mon & Sat 9:00AM - 9:30PM; Tues-Fri 5:30PM-10:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dean Reichard can be reached on 703-308-3682. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

ewt  
December 7, 2002

 12/12/02

DEAN A. REICHARD  
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